

and artifacts exist at Jinny Hill and collectively, establish a coherent pattern of deep mining based on the Cornish system. Also, historic archeological features, alleged through local folklore to belong to the mining era, were proved not to be contemporaneous. Reconstructing the ore-processing flow-sheet for the Jinny Hill mines revealed that three distinct dressing steps, cobbing (liberation), hand picking (separation), and washing (cleaning), are required to explain the extensive barite horizon in neighboring wetlands.

Hydrological changes and subsistence threats in underground mining districts is a well-documented and nearly intractable problem nationwide. On a smaller scale, the problem holds true for the Jenny Hill barite mining district in Cheshire. The University of Connecticut's geoarcheological investigations provided significant new information to the Town of Cheshire concerning potentially unstable mining-related areas which should guide future town-based planning decisions.

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Arthur B. Cohn

## Cow Heads and Trout Farms

### Underwater Exploration of the Dalliba-Lee Mine

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**I**t was late fall, and our nautical archeology fieldwork on Lake Champlain was completed. I was looking forward to a few quiet moments for research and writing. It was a routine day when an unusual telephone request came in from the town historian of Port Henry, New York. "One of our townspeople was in his flooded iron mine feeding his fish (he raises trout in the mine) and, as he was out on his dock, he looked down through the water and thought he saw an ore cart. We heard you might be able to help."

Indeed, the Lake Champlain Maritime Museum endeavors to assist regional agencies with the management of underwater cultural resources and I wanted to respond positively to Port Henry's request. Besides, the story was so intriguing. Having been a professional diver since 1974, I have been privileged to dive in many interesting

places, but I had never explored a flooded iron mine. How to begin?

The mine was known as the Dalliba-Lee mine, named for its first and last operators. James Dalliba had established the first iron foundry in the community in the early 1820s, just after the opening of the Champlain Canal, which connected Lake Champlain and the Hudson River. In fact, Dalliba had been responsible for naming the town Port Henry after Henry Huntington, his wife's uncle and his benefactor. I told the town historian Joan Daby that the first step would be to come over and just see the mine. An on-site inspection would allow me to get a sense of the physical layout: the distance from the road, conditions which would affect actually getting equipment to the mine, staging issues for getting in and getting out, visibility and water temperature, and the relative stability of the structure. With this information, we would be

Lake Champlain Maritime Museum team members, Art Cohn, Erick Tichonuk, and David Andrews (left to right), plan a dive at the Dalliba-Lee Mine. Photo by Alan Denney, courtesy LCMM.

able to decide whether it might be safe enough to proceed. If it looked feasible, I could begin to plan a simple exploratory dive. It was oddly coincidental that earlier in the year I had hiked to the entrance of another flooded iron mine overlooking the shores of Lake Champlain. I hoped someday to examine that flooded mine, but the logistics were horrible. One would have to ferry all gear by boat, then transport it up an almost vertical climb several hundred feet to the mine entrance. Exploration would require an extensive support team and an entire day just to get the equipment to the site. As I drove over to Port Henry, I had visions of a similar mountain-climbing challenge.

Port Henry, a town situated along the western shore of Lake Champlain, had reached its economic heyday as a 19th-century mining community. The community has witnessed economically challenging times since Republic Steel closed down the last mining operation in 1971. However, the Port Henry-Moriah Economic Development Zone Office had recently received a substantial ISTEAA grant to renovate a former mining-related carriage house into a Railroad and Mining Museum as part of an effort to revitalize the town's economy. It was exciting to envision that a side benefit of our archeological investigation might be to provide some positive synergy for that effort. In particular, local residents wanted to know if the ore cart in the mine might be recovered for the new museum.

Once in the town center, I drove due west away from the lake into the hills that rise toward the Adirondack high peaks. I turned onto a residential street where I was greeted by Mike and Lena Aitner, the property owners, and a small delegation of townspeople. After appropriate introductions, I braced myself for a challenging hike to the mine. We walked out past the Aitner's home down a path around a rocky hill, and within minutes, we were at the mine entrance. We had traveled no more than 100 yards on relatively level ground; approaching the mine would not be a problem. The mine had two openings, both enclosed by Mike Aitner to control the "marine environment" for his trout farm. The mine's entry was predictably dark, but Mike had installed electric power and lights for his fish operation and a floating pier so that he could easily manage his floating fish pens. Based on these unusual circumstances, I knew that an exploratory dive was feasible and required only minimal planning in order to execute a safe, introductory fact-finding dive.

Having never dived in a flooded mine, I decided to adapt familiar wreck and ice diving procedures. Project goals were extremely modest: to be able to enter the shallow entry area without silting it in and to explore the area where the ore cart was supposed to be. This preliminary evaluation



could be accomplished within the open entry pool area, which made it a non-penetration dive. After reconnoitering in this area and if the conditions seemed right, it would permit consideration of further, more complex investigations. I prepared a penetration line with one end secured to my diving harness and the other end tied to a substantial tree outside the mine. Several experienced team members functioned as line tenders and safety divers, similar in arrangement to an ice diving situation. Team members were properly suited up and had established a second penetration line, which would allow them to come to my aid if the need arose. The plan was for person-to-person communication when I surfaced after my initial exploration of the entry pool area; alternatively, we would use traditional line pulls to communicate if I chose to further investigate the mine.

As a planning precaution, it was requested that local emergency personnel with suitable communication equipment be present at the mine. Pre-dive organization occurred on tarps on level ground just outside the mine, i.e., ropes were arranged, first-aid and oxygen equipment (standard on any dive operation) set up, equipment assembled and checked, the team oriented to the site, and the dive plan reviewed for final time. After we had talked everything through and could not think of any additional adjustments, we proceeded to gear up for the dive.

A professional diver is trained to control anxiety, but I must admit that I was excited and even a bit anxious as I prepared to enter this uncharted territory. The water seemed clear, although in the enclosed mine environment it would be the equiva-

lent of a night dive. Water temperature would be 40 degrees and would require wearing a dry suit. I was equipped with a single steel 94-cubic-foot tank of air, with a redundant 20-cubic foot pony-bottle back-up air system. I planned to use a single powerful dive light with two additional lights attached at various places for emergency back up. I had a dive knife to deal with any entanglements. As I sat on the floating dock letting my handlers secure my mitts and do the final gear check, I focused on our principle concerns: 1) avoiding any undue disturbance of silt within the mine, which would trigger an early termination of the dive; 2) evaluating the structural integrity of mining-related features every step of the way; 3) not moving forward until it was assured that the mine was secure; and, 4) making sure my line connection back to the safety of the mine entrance was intact.

Questions about what I was about to encounter flew through my head. Would there be shoring timber holding up an unstable roof? Would the silt of 120 years of disuse make visual exploration impossible? Would there be a passageway that penetrated endlessly into the center of the earth? Because of these unknown conditions, we limited the exploratory dive to 150 feet, the length of the safety line back to the surface. As an additional precaution, I would take no camera or recording clipboard as I wanted 100% of my senses available to look for possible hazards. All information on this dive would be gathered by empirical observation, which if the circumstances warranted, would be used to plan subsequent dives.

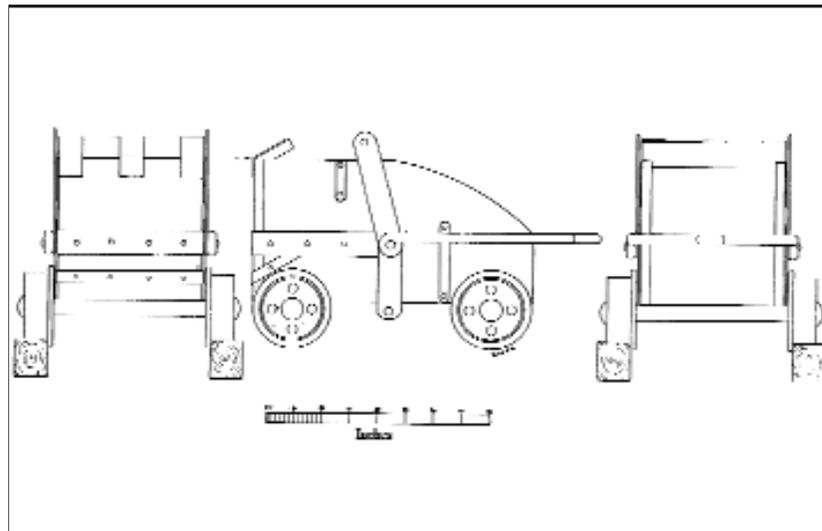
After inflating my buoyancy compensator so that I would stay as close to the surface as possible in order to minimize the chance of disturbing of silt, I rolled in and looked downward in order to take my first glimpse of the conditions and received a surreal shock. As my eyes became accustomed to the watery darkness, my dive light revealed cow heads, dozens of cow heads, scattered on the bottom all around me. I began to laugh—of all the things I had braced myself to deal with, cow heads were not on the list. I surfaced, inquired if anyone might be able to account for their presence, and was informed that they might be left over from a slaughter house which operated in the area some years ago. Filing that away as an unforgettable experi-

ence, I began to explore the mine. Mike Aitner had been right; not far from the floating dock was an intact ore cart sitting on two wooden rails. The rails descended into a cave-like shaft further into the mine.

The submerged mine entrance area was littered with debris. In addition to the cow heads, there were wagon wheels, pieces of horse-drawn equipment, intact bottles, branches, and modern equipment from Mike's fish operation. The bottom was silty and I made a significant effort not to unduly disturb it. Once I completed the examination of the entrance area, I concluded that the structural stability of the upper mine allowed further downward investigation of the mine. Visibility also remained reasonably good (about 10-15 feet). The mine's cart tracks were a pleasant surprise, since they served as both a travel route and a central reference point for examination of the mine shaft. The dive complexity changed with the descent in that movement was now limited by rock overhead. Evaluation of the condition of the mine ceiling became a priority. Structurally it looked fine, but I noticed a potential concern. As my exhaled bubbles floated upward to the mine ceiling, a light dusting of iron-stained particles rained down into the water column. I suspected that these particles would begin to limit visibility and that the further the descent, the poorer the visibility would be on the return route.

"No problem," I reasoned. Much of my career has been spent documenting historically significant shipwrecks in conditions of very limited visibility. With a safety line and the cart tracks to guide me, I felt confident that I could explore the mine at least to the limit of the safety line and return to the entrance. I continued down the tracks, sweeping out to either side then back to the tracks, which were composed of heavy timbers scarfed together, but which had separated in

*Preliminary views of the ore cart in the entrance chamber of the Dallibalee Mine. Left to right: back, profile, and front views. Drawings courtesy of Scott McLaughlin.*



places. The dive had commenced about 75 feet down the sloping tracks, when they abruptly ended and the mine bottom leveled out. Unfortunately, the iron “rain” from the mine roof became concentrated at the bottom of the mine shaft and visibility, in places, was reduced to zero.

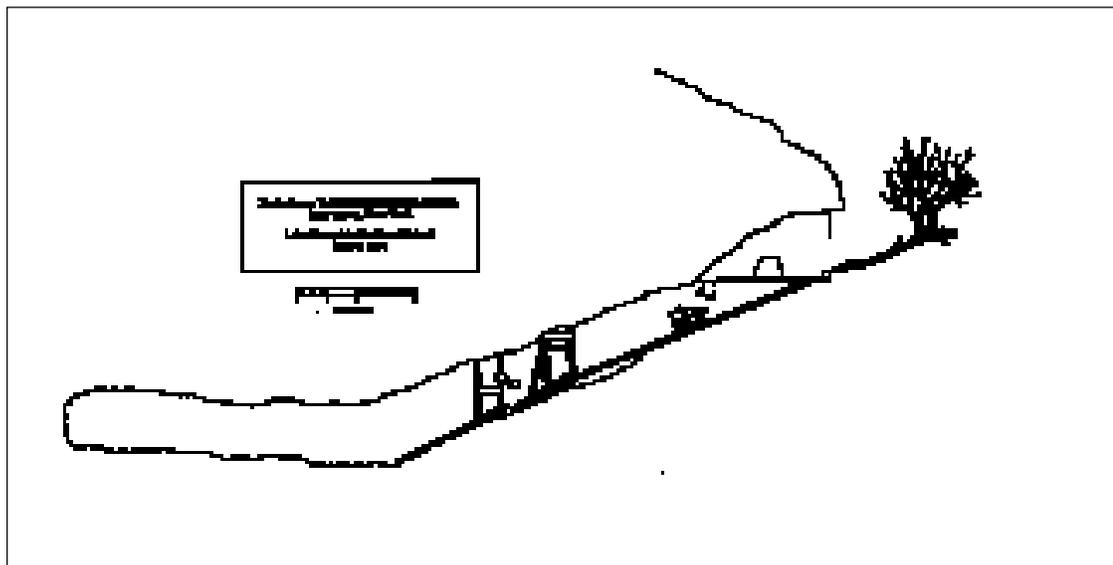
On one side of the cart track, the mine appeared to expand into a large room or chamber, while straight ahead there seemed to be a shaft that continued further into the mountain. On the other side of the chamber, I discovered a debris field with mining equipment and boards near several vertical shoring timbers (oak, I thought). The timbers appeared to separate the main shaft from a small room-sized area, which contained the remnants of a large wooden box. Heavy oak planks that had once been fastened to the vertical timbers were mostly lying on the floor, apparently having fallen as oxidation caused their iron nails to crumble and the planks fell under their heavy weight. I quickly realized that the remaining planks were a potential hazard, and comfortable with the initial examination, I slowly followed the tracks back to the ore cart that had started it all. Upon surfacing, I reported all that I had seen and quickly sketched it to get as much down on paper as possible before I forgot the details. I also had to confront the next challenge of the dive: what professional recommendations could be offered to the people of Port Henry.

Making management recommendations about submerged cultural resources is one of the Lake Champlain Maritime Museum’s missions. The people of Port Henry were justifiably excited about the archeological potential that the mine represented, especially in light of their current efforts for a new mining-related museum. Taking stock of the mine’s condition, its archeological potential, and the town’s efforts to use its history as an economic

stimulus, the Dalliba-Lee mine warranted further investigation and documentation. We encouraged the involvement of local high school students in building a replica of the ore cart for an exhibit and combining students and historical society members to further research the mine’s history. By involving students and citizens, we envisioned a broad community effort in the investigation and interpretation of the Dalliba-Lee mine.

Comfortable with the stability of the mine, the Lake Champlain Maritime Museum selected several experienced archeological divers to map, draw, and photograph what I had already seen. However, safety concerns existed about the roof-silt problem and the heavy planks still hanging on the vertical timbers. I also wondered if those timbers had been expressly placed there to shore up an unstable ceiling. The foremost research-related concern focused on defining the limits of the large room and the potential tunnel that began at the bottom of the entry shaft. It was unclear from the initial dive how much penetration would be required in order to fully explore the mine’s extremities. To proceed further would require additional technical training.

As a diving instructor since 1974, I have always taught divers to know their limitations and dive within them. I felt that moving out to explore these undefined mine areas was pushing my procedural envelope. The flooded Dalliba-Lee mine became the catalyst for taking an intensive week of instruction in technical cave diving procedures. It was just what the situation required, and at the conclusion of the cave training, I felt comfortable with continuing the examination at least another several hundred feet further into the mine. The Lake Champlain Maritime Museum would ultimately stage two additional documentation dives.



Using cave diving techniques, particularly penetration line procedures, a permanent travel line was established that followed the now-defined wooden tracks. Excursions using line-reels would depart from the tracks to define the limits of the chamber and the suspected shaft. We were both relieved and disappointed with the results. The large chamber, where ore had been mined until the 1870s, was found to extend in a semi-circular arc approximately 75 feet from the end of the track. The shaft, which I had envisioned as penetrating hundreds of feet into the depths of the mountain, petered out approximately fifty feet from the end of the cart track. The extreme limits of the mine were actually only slightly larger than the area the initial dive had covered.

We now set out to complete a preliminary mapping of the mine and to document its significant features. During the two documentation dives, still photographs and a video tape recording of the interior were completed. The debris fields at the mine entrance and at the base of the track were mapped. The ore cart and the track were recorded *in situ*. The anticipated deterioration of visibility in the mine from the ceiling particles that I had observed clouding up the water column on the first dive never materialized. Apparently, the oxidation that caused those particles was a slow event. The first dive had cleared out most of the loose material and, during the remaining dives, overall visibility remained acceptable.

On our last dive visit, students from the Moriah High School history club made a field trip to the mine and discussed with the team what we were doing and how we were going about it. We again encouraged their participation in future community-based historical research.

The Lake Champlain Maritime Museum completed a report and recommended that the school and the historical society collaborate in a comprehensive research effort that could be used for the basis of interpretation at the new museum. We also recommended that this research include interviews with local residents who participated in iron mining until it ended in 1971. We further encouraged the high school to think about building a replica ore cart, which along with our photographs, drawings, and video footage, could be woven into an interesting exhibit. The Lake Champlain Maritime Museum identified a number of unresolved questions concerning the material in the mine as well as the functions and origins of some of the features of the mine. More field and archival research, executed in conjunction with the development of the museum, was identified as a preferred approach. For conservation and economic reasons, we concluded that immediate recovery of

objects submerged in the mine was not recommended at this time.

Since our dive project, Port Henry has received an additional grant which allowed it to interview local residents who were directly involved in the iron mining industry. In addition, students from Mike Aitner's shop class have completed a scale replica of the ore cart, which was the catalyst for this project. All of these will be used to help develop the first round of exhibits. We hope that the Dalliba-Lee Iron Mine and our investigation of it will add a different perspective to the public interpretation of the community's mining history as the museum is established.

Investigating the flooded iron mine at Port Henry was an interesting logistical and diving challenge. In hindsight, we were clearly operating at the edge of our experience level while trying to stay true to our primary objective, diver safety. Flooded mines pose significant potential hazards with obstructions, limited visibility, and unstable features. On the other hand, the Dalliba-Lee mine turned out to be a perfect place to gain suitable experience. It was relatively small, stable, and archeologically interesting, although our success in this case does not mean that the Lake Champlain Maritime Museum is ready to specialize in this potentially hazardous activity. I think any future flooded mine project will need to evaluate the same issues. Diver safety and the stability of the flooded mine environment are the most important criteria when considering any field examination, along with the experience and training of the archeological divers (don't kid yourself here - experienced divers die in caves each year) and finally, the archeological potential of the site.

The Lake Champlain Maritime Museum and the Town of Port Henry had a mutually successful project and we were very lucky. The Dalliba-Lee mine was the perfect place to explore the complicated issues that surround potential underwater study of a flooded mine. Since that investigation, the Lake Champlain Maritime Museum has received other invitations to explore flooded vertical mine shafts and other nasty places, and we have respectfully declined. Safety and caution must be the primary guide for this unusual environment.

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